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Heart Rots of Appalachian Hardwoods

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Decay in the heartwood of Appalachian hardwoods is a major source of loss in both volume and value of timber. This decay is caused by a variety of fungi which, by means of their windblown spores, enter the stem through open wounds. Once in the tree, the fungi feed upon the heartwood and in so doing bring about the condition known as decay or rot. After decay has been in progress in the tree for a number of years, toadstools or conks are often formed on the outside of the tree. These are the fruiting structures of the decay fungi. It is on them that the infecting spores are produced and released to the winds. There are vast differences in the frequency and abundance of these fruiting bodies because of the great variety of fungi causing heart rot. Some trees may be badly decayed even without producing any such fruiting bodies.

Means of Entry

Entrance points for heart rot fungi are usually found in exposed wood of any part of a tree that has been accidently wounded by fire, logging, or storms. Branch stubs or branches killed by natural suppression also provide means of entry for some of the more important heartwood destroyers. Butt rot in sprout hardwoods usually progresses from the defective parent stump into the attached sprout.

Important Decay Fungi

Following are brief descriptions of the fruiting bodies (conks) and decay that will aid in identifying some of the more important species of fungi causing decay in Appalachian hardwoods.

Stereum frustulosum produces small (less than 1 inch long), flat, dirty white, inconspicuous fruiting bodies usually on dead, exposed wood. This fungus produces a white pocket rot of oaks, and often spreads throughout the entire heartwood of a tree. The pockets are small, spindle shaped, and lined with white mycelium.

Hydnum erinaceus produces a soft, white, globular-shaped, fruiting structure, with long slender teeth or spines on the lower surface. This white heart rot of oaks often causes large hollows in its advanced stages.

Polyporus sulphureus produces abundant annual, shelflike conks. When fresh, they have a brilliant orange upper surface and a sulphur-yellow under surface. Old conks are hard, brittle, and dirty white. The brown cubical rot caused by this fungus may be found in both the butt and top of hardwoods.

Polyporus berkeleyi produces a light buff conk several inches wide, with a short stem; conks are usually found at the base of decayed trees. The decay is yellowish brown, and often leaves the ray cells intact.

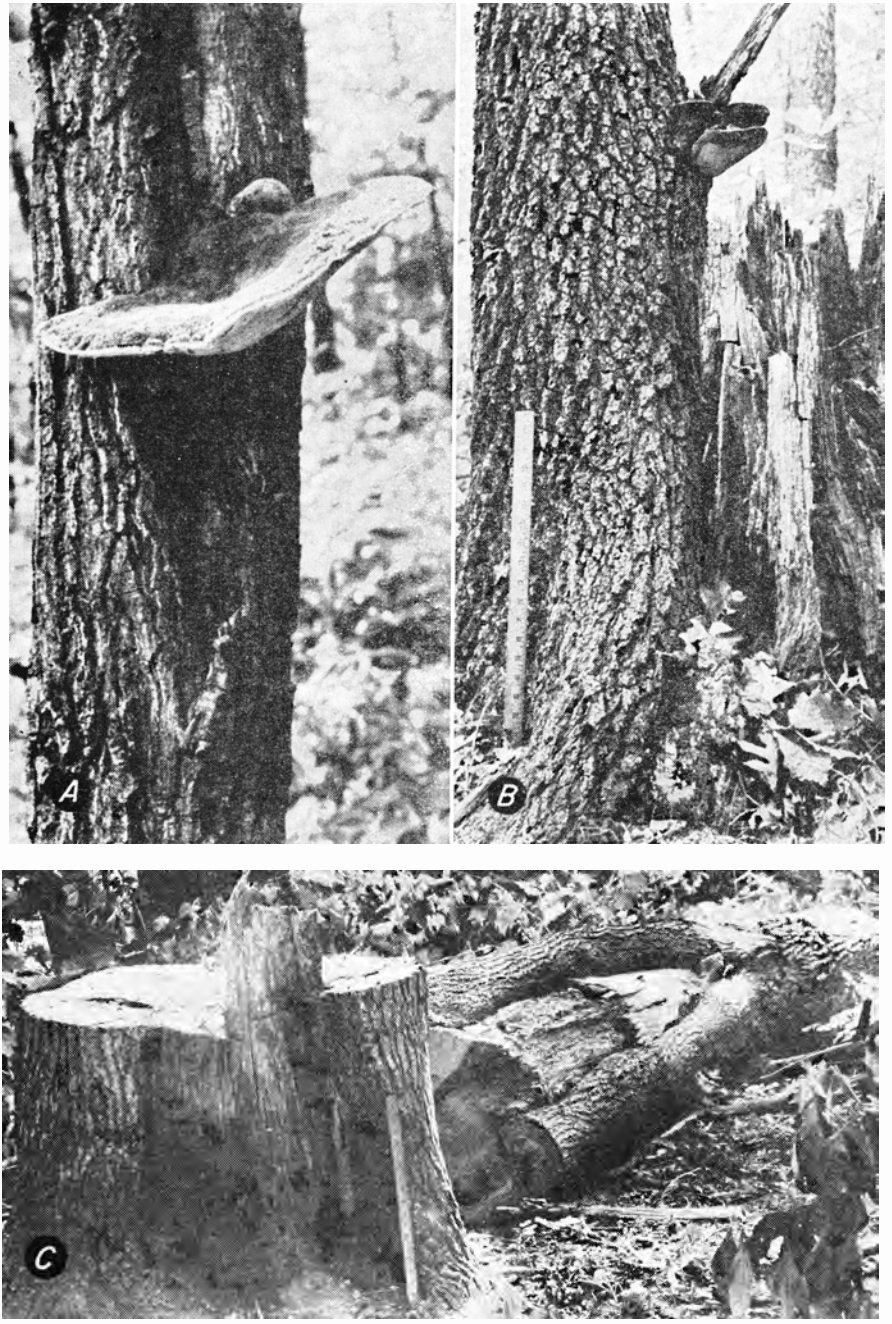

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FIGURE 1.—Indications of heart rot. *A*, *Polyporus hispidus* canker and conk on chestnut oak. *B*, Large stump and black oak sprout; note conk at base of dead branch stub. *C*, A 16-foot log left in the woods as a result of a 28-year-old fire scar on a white oak; rot caused by *Stereum frustulosum*.

Rot is confined to the base of oaks and other hardwoods.

Stereum gausapatum produces abundant, small, thin, shelf-shaped conks on old oak stumps. The conks are light tan, with darker streaks on the upper surface, slightly darker tan and smooth on the lower surface. The white mottled rot is prevalent in sprout stands, causing about 60 percent of all the oak rot that originates from parent stumps.

Poria spiculosa produces olive-brown, extensive, flat, fruiting structures on dead snags or down trees after a lapse of one or more years following death. This fungus causes a white trunk rot of upland oaks and hickories. The rot is usually associated with a canker that develops around a branch stub and resembles a partially healed wound.

Polyporus hispidus produces an annual conk with a dark brown, velvety upper surface and a golden brown under surface; the conk falls to the ground shortly after formation. The decay is a soft, spongy, white rot, mostly of oaks, and is almost always associated with long, irregular-shaped cankers with prominent callus growth (fig. 1).

Basal Decay

Besides killing trees, fire is the principal cause of basal wounds through which heart-rotting fungi enter living trees. The amount of butt rot that develops following basal wounding is correlated with wound width and age. Trees without visible basal wounds or with small wounds usually have only a small amount of decay. For example, an oak with a 30-year-old basal wound 8 to 13 inches in width will ordinarily have about 20 board-feet of cull due to decay, whereas a tree with a wound of the same age but 26 to 31 inches wide will have more than 90 board-feet of cull due to butt decay.

The second-growth upland hardwood forest of the Appalachians comes from three sources: seedlings, seedling sprouts (growing out of stumps that are 2 inches or less in diameter), and stump sprouts (growing out of stumps larger than 2 inches in diameter). As a rule, seedlings will make the best trees, seedling sprouts come next, and stump sprouts are the least desirable.

Sprouts on most hardwood stumps originate in the vicinity of the root collar; however, some sprouts originate higher on the stumps. Sprouts originating 2 inches or more above ground level are more subject to decay than those originating nearer or even below the ground line. Butt rot may affect as high as 60 percent of the trees in oak stands originating from stump sprouts. Considerable variation occurs, depending on the size of the parent stumps, previous history of the stand, height of sprout origin, and species involved. Field studies have shown black oak to be the most susceptible to stump rot, with 39 percent affected, followed by: scarlet oak, 28 percent; red oak, 22 percent; white oak, 19 percent; and chestnut oak, 11 percent.

Basswood sprouts are often completely hollow from the base to the upper trunk as a result of decay originating in the parent stump. Other upland species such as yellow-poplar and red maple are also subject to stump decay, but figures are not available on its prevalence in these species.

Top Decay

Only a part of the loss from decay in merchantable upland hardwoods is made up of butt rot resulting from basal wounds. Some of the decay has its origin higher on the trunk or in large branches.

Conks, broken main stems, rotten branch stubs 3 inches or more in diameter, large surface wounds, and blind knots often indicate major top rot. Presence and general extent of top rot can be judged by the number and location of these visible defects and by the age of the stand. The older the stand and the more defects present, the greater the amount of top decay.

Total Decay

Total cull from decay, including both top and butt rot, for Appalachian hardwood trees of merchantable size having basal scars from 10 to 30 years old, has been determined for the oaks and several other species. The following species are arranged in descending order according to cull percentage due to decay: scarlet oak, post oak, red maple, basswood, cucumbertree, chestnut oak, blackgum, southern red oak, black oak, white oak, yellow-poplar, red oak, and hickory.

Reducing Losses

Losses from heart rot in upland hardwoods can be reduced if these practices are followed:

(1) Maintain well-stocked stands. In stands with adequate stocking, the branches on the lower trunk are shaded out when they are small, thus greatly reducing the likelihood of decay entering through branch stubs.

(2) Mark for early removal during logging operations all old trees with conks, large butt scars, rotten branch stubs, or other evidence of heart rot.

(3) Salvage scarred trees as soon as possible to keep decay losses to a minimum after fire burns through a stand.

(4) Remove as soon as possible trees severely injured by wind, snow, ice, or logging.

(5) Eliminate sprouts from large stumps as well as those originating high on the smaller stumps. Do this when the sprout stand is 12 to 15 years of age. Such a treatment should reduce the stand largely to single-stemmed, low-origin sprouts with little likelihood of decay.

The timberland owner should prevent fire, logging injury, and high grading (cutting the best and leaving the worst). If Appalachian hardwoods are cut before reaching an age of 100 years, and if the stands are kept free of fire or other injury, decay losses will be small. These are just good forestry practices, and as such are generally applicable to all southern upland hardwood stands.

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